

***California Air Resources Board  
Chairman's Air Pollution Seminar Series  
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**Overview and Results of a Statewide Survey of Vehicle  
Registration Status in California**

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## ***Project Sponsors:***

**California Air Resources Board**

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## **Data Collection**

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Alison Rowlen, Judy Swineford, and Sylvester Wheeler**

## **Data Entry**

**Jennifer Anderson, Warren Katzenstein, Lindsey Miller, Shelly Miller,  
Andrea Ruiz, Jessica Walters, and Ryan Wicks**

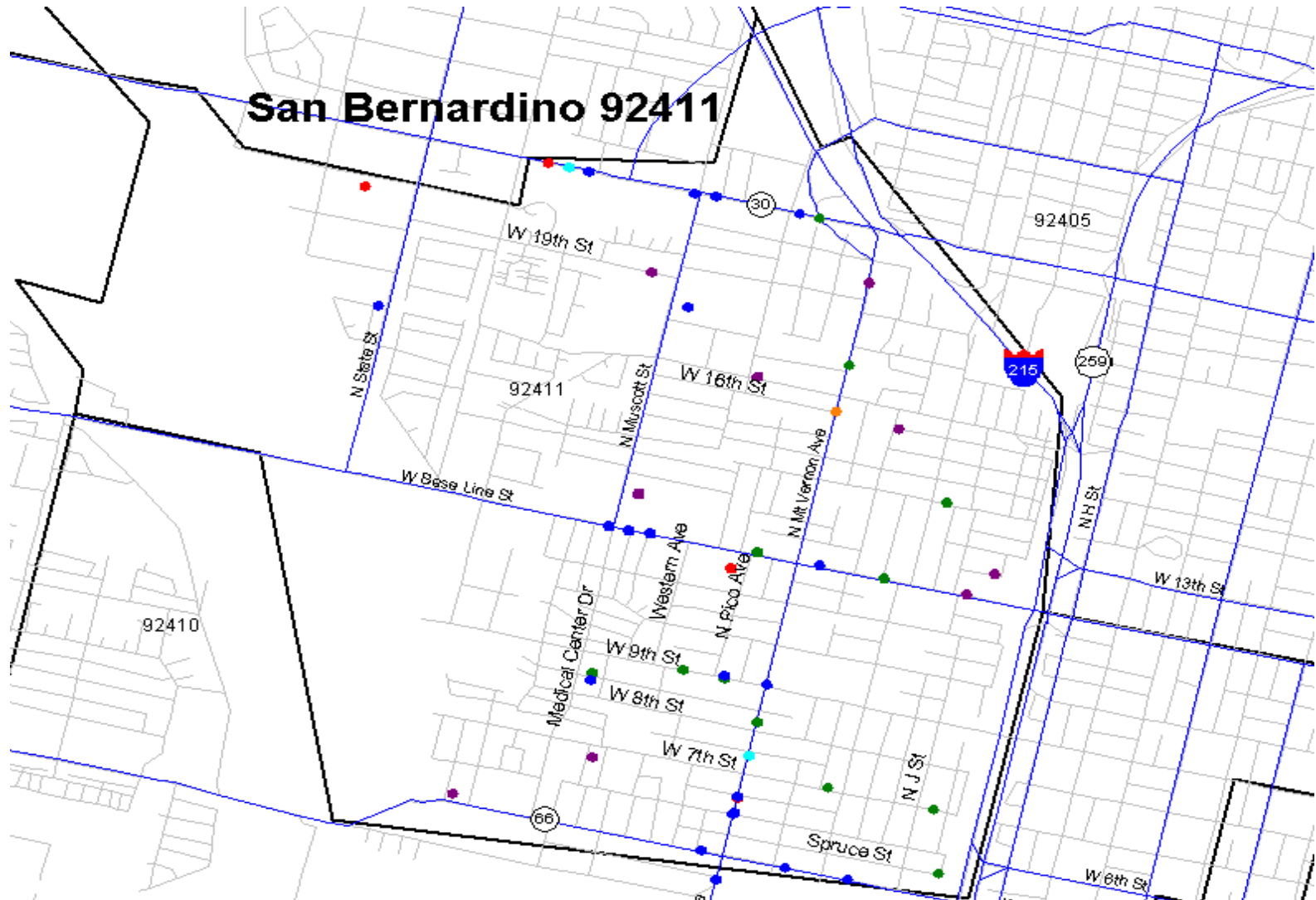
## **Site Selection**

- **Data collected in all 58 counties in California, proportional to county population.**
- **Minimum county sample size set to 200. Actual sampling was less in the smallest population counties.**

## **Site Selection**

- **Data collected at randomly selected zip codes within each county.**
- **Sample size proportional to zip code population.**
- **Random parking lots throughout the zip code.**

## Parking Lot Selection



## **Data Capture**

- **Data collected by cruising parking lots and photographing vehicles in the lot.**
- **Data collected at 3 to 5 mph without stopping.**

## **Data Capture**

- **Unregistered Vehicle Survey data collection using digital still cameras.**
  - **Toshiba M4 digital camera selected for rapid refresh rate (0.8 seconds between pictures).**
- **Data stored on Flash Media for download to PC for data entry.**



# Data Capture



# Data Capture



# Data Capture



## Data Capture

<b>Date</b>	9-13-00	<b>Time</b>	9 am
<b>Driver</b>	MATT	<b>Foto</b>	BUTCH/ CARRIE
<b>Cnty</b>	SAN FRANCISCO	<b>Cam.</b>	M4s
<b>City</b>	SAN FRANCISCO	<b>Zip</b>	94112
<b>Add.</b>	6900 Mission		
<b>BUS.</b>	Strip Mall by Grocery		



# Data Capture: ZIP Code Centroids



## License Plate Obstructions - Non-Random



## License Plate Obstructions - Random



## Public Interactions

**95% Oblivious**



**4.9% Notice,  
but don't care**



**0.1% Notice,  
but not happy**





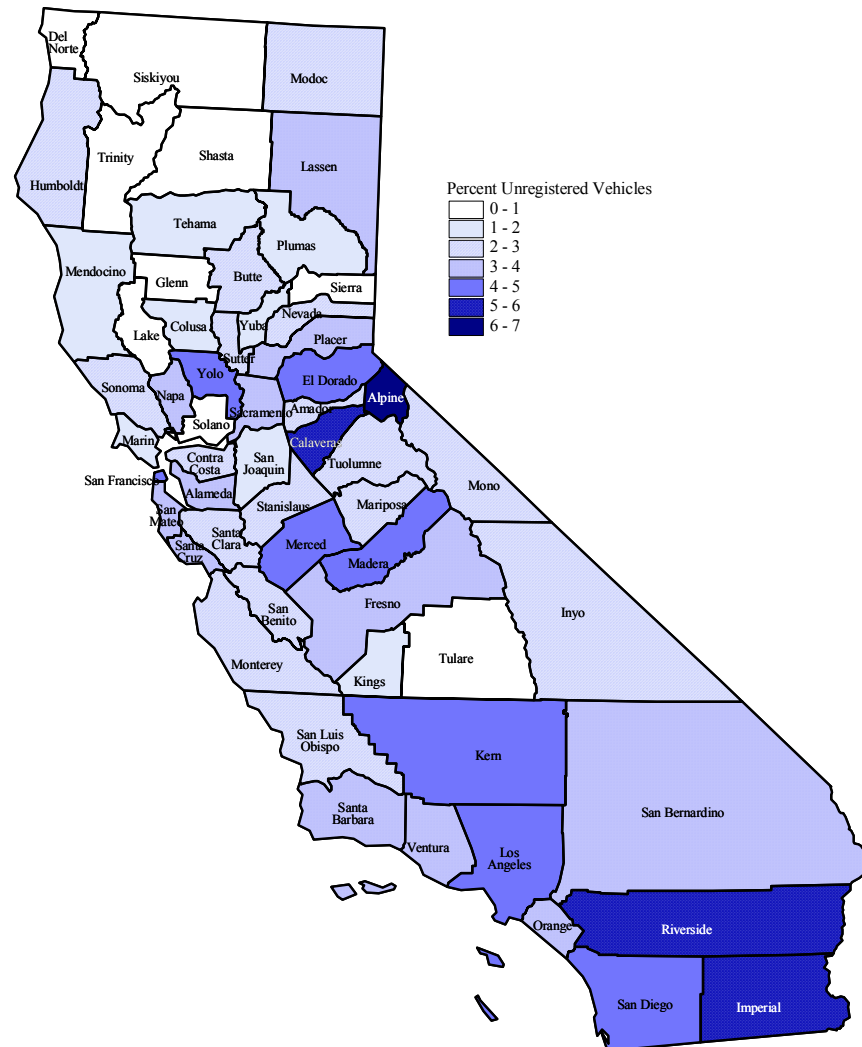
## **Data Analysis**

- **Two methods of registration classification:**
  - **Observed data.**
    - **Vehicle license plates were characterized by registered, unregistered, dealer, front, no plate, out of state, unknown state, and unknown based on stickers observed on the plate.**
  - **DMV comparisons.**
    - **Vehicle license plate data will be submitted to the DMV to obtain official registration status.**

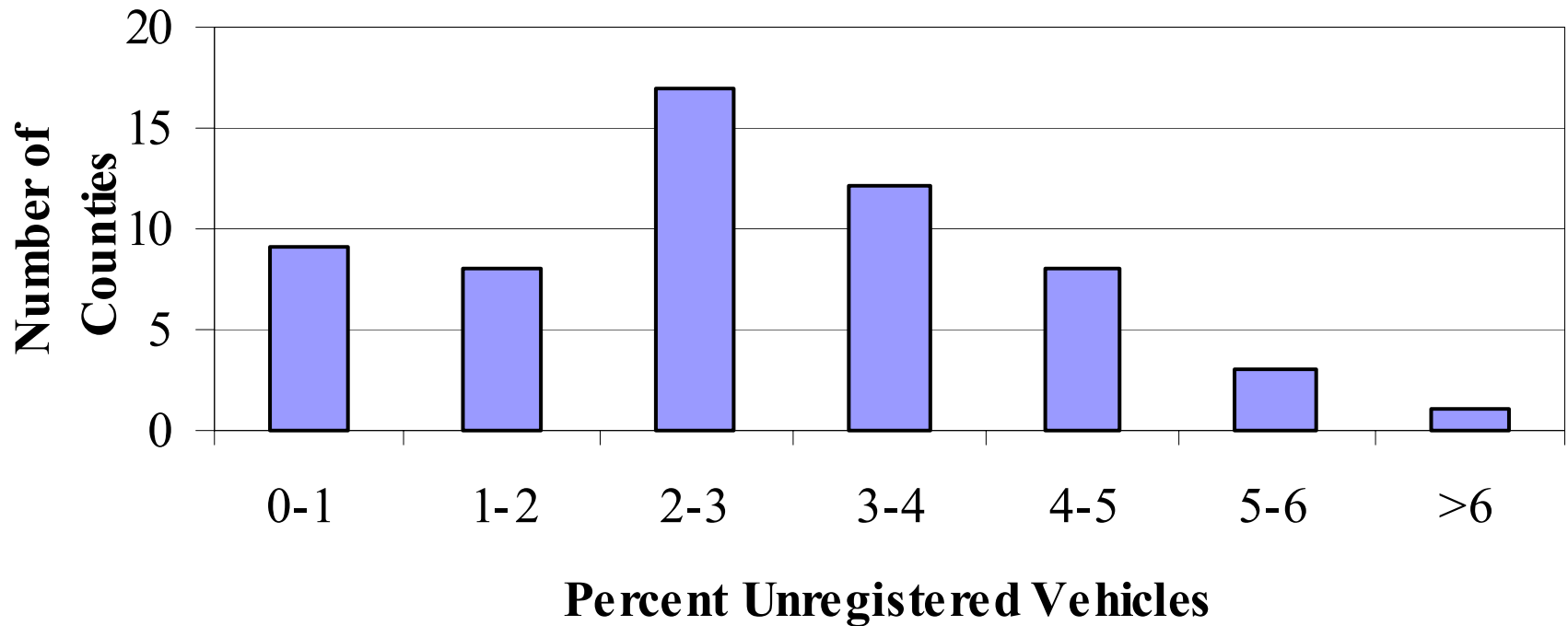
## Data Analysis



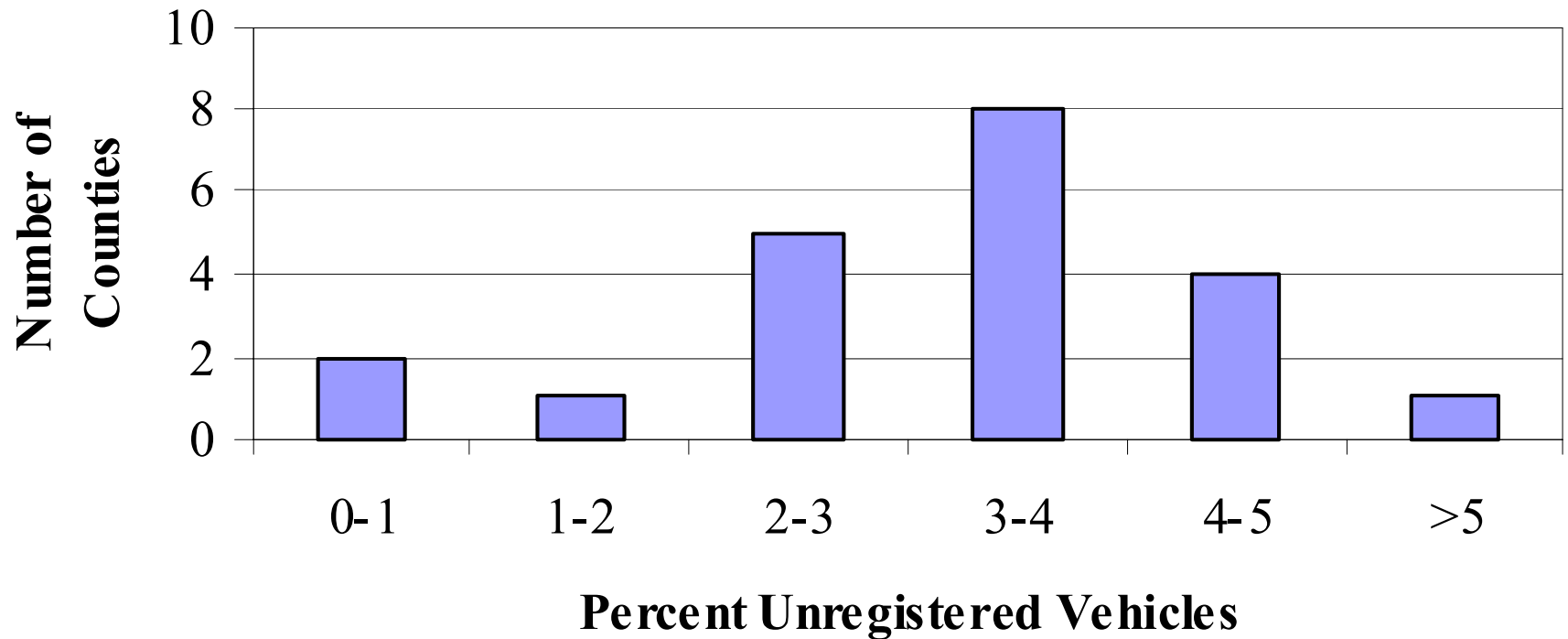
## Average County Non-Registration Rate 3.5%



## County Non-Registration Rate: All counties

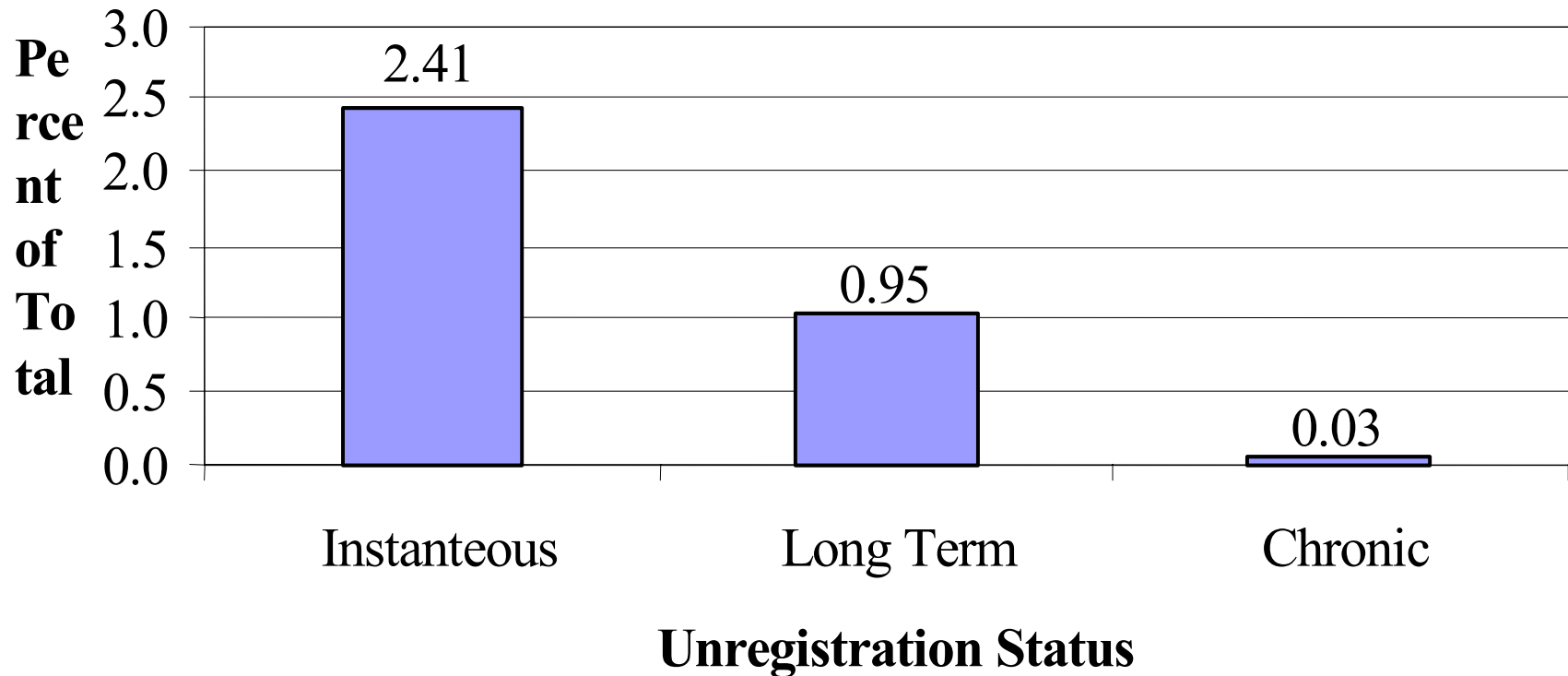


## County Non-Registration Rate: Counties with population >300,000



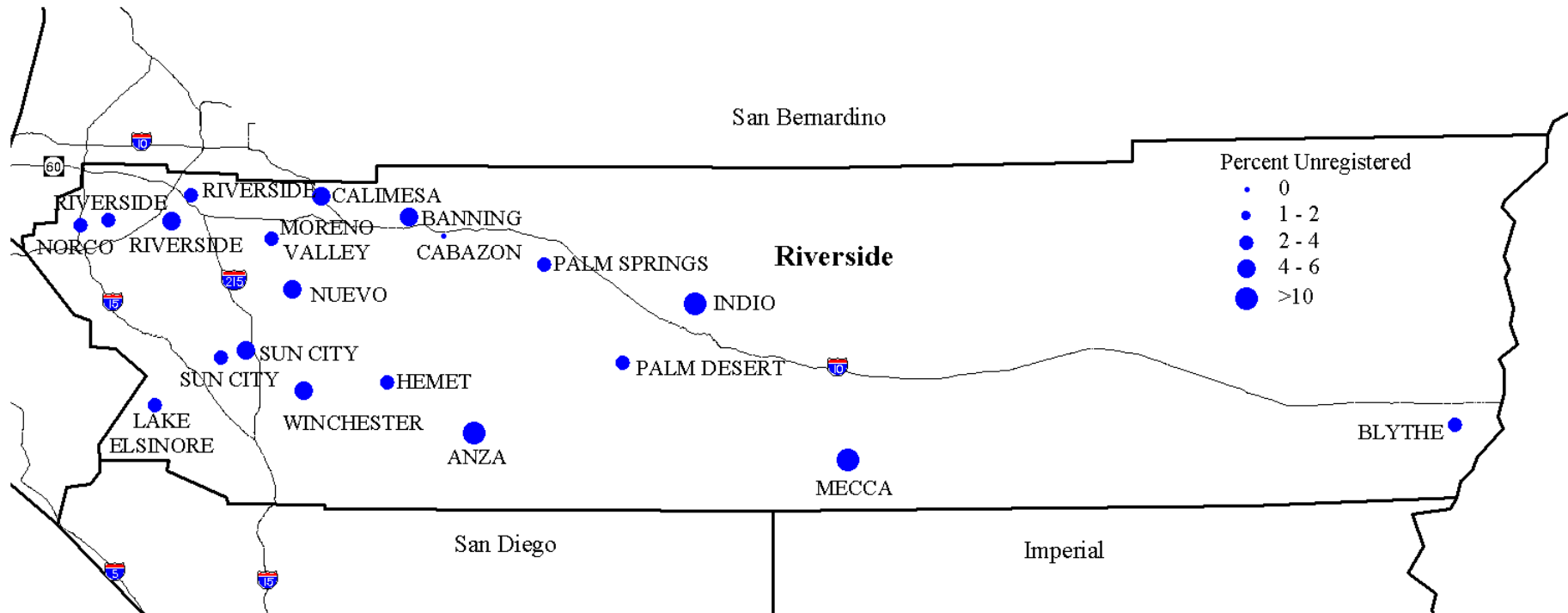
## Non-Registration Rate by length of time unregistered (overall 3.38%)

- Instantaneous - <3 months
- Long Term - 3 months to 2 years
- Chronic - > 2 years



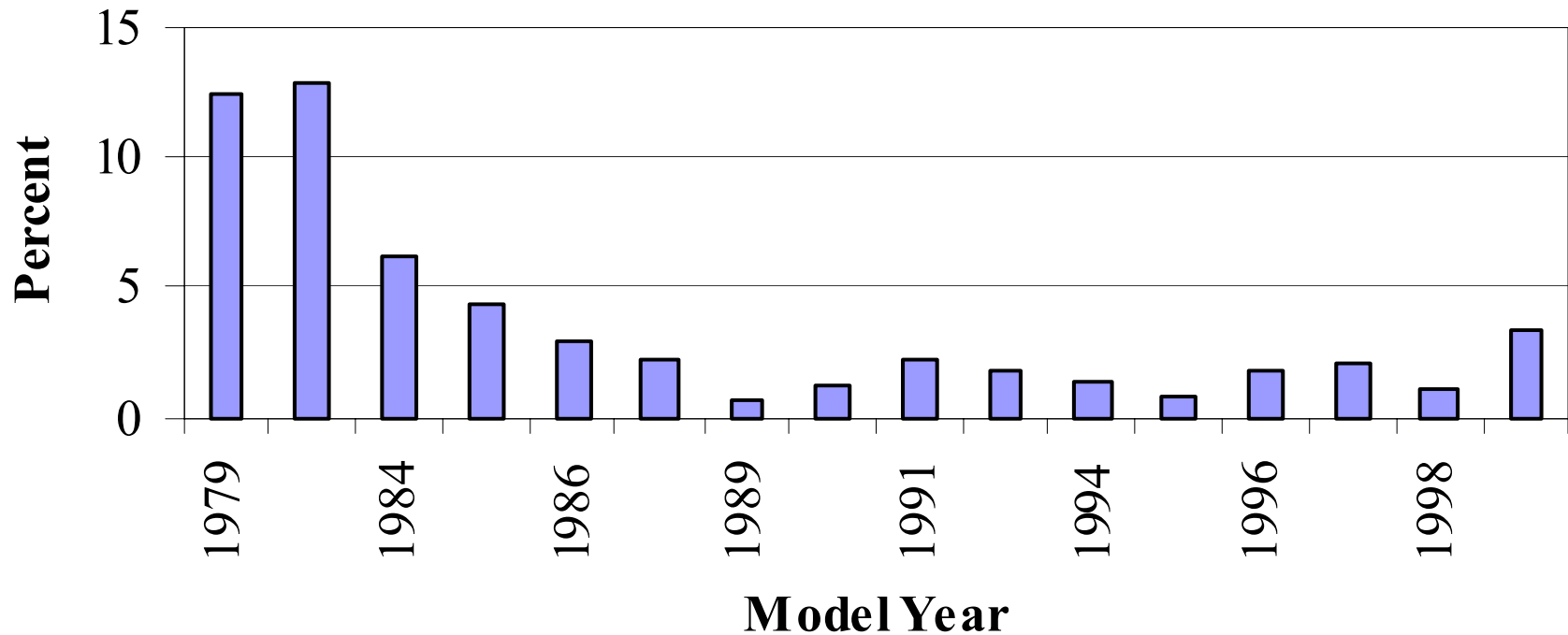
# Results:

## Riverside County: Percent unregistered vehicles by zip code



# Results:

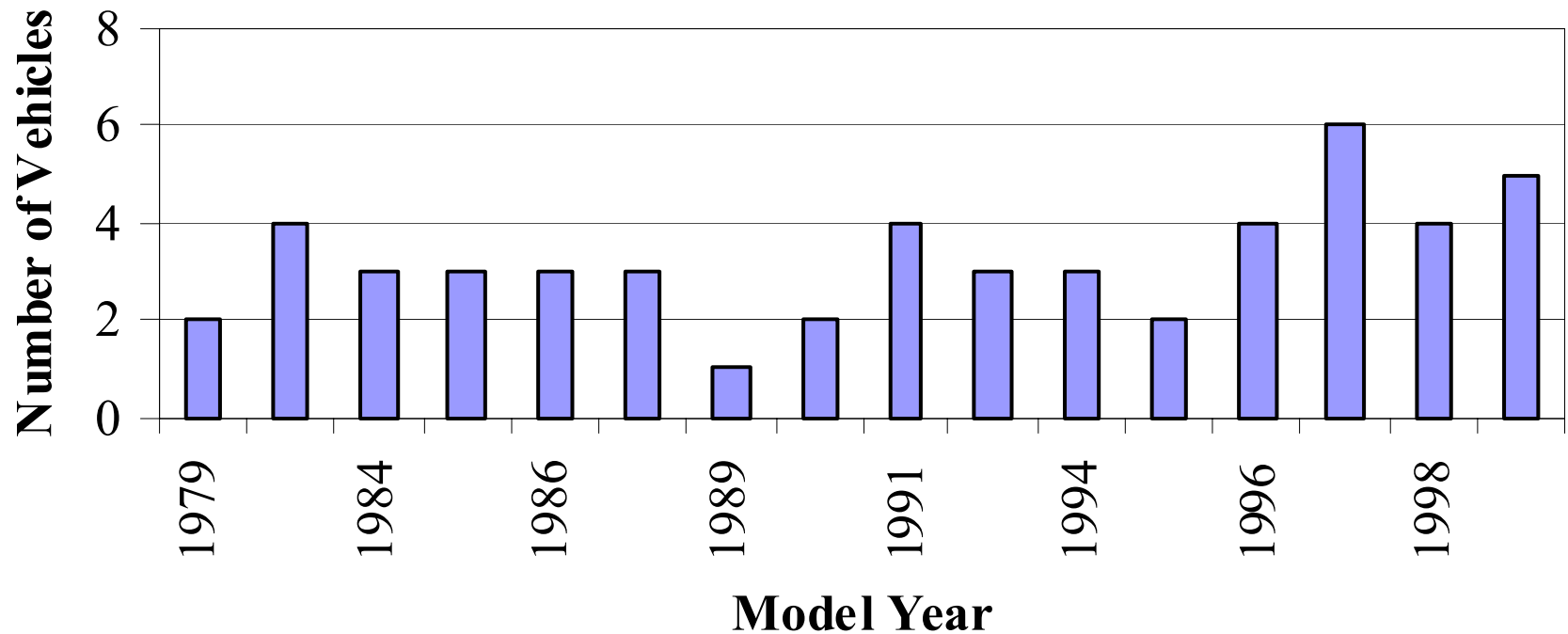
## Riverside County: Percent of vehicles > 3 months unregistered





# Results:

## Riverside County: Number of vehicles > 3 months unregistered



# Results:

## Demographic Analysis: County Median Household Income

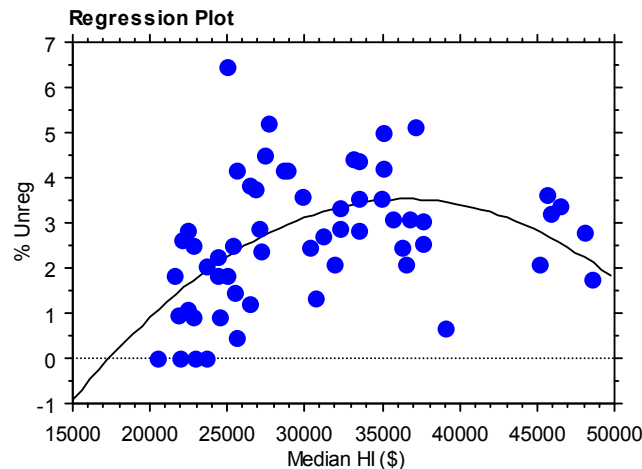
% Unreg vs. Median HI (\$)

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	2	29.383	14.692	9.157	.0004
Residual	55	88.246	1.604		
Total	57	117.629			

Regression Coefficients

% Unreg vs. Median HI (\$)

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	-9.308	3.036	-9.308	-3.066	.0034
Median HI (\$)	.001	1.879E-4	3.668	3.744	.0004
Median HI (\$)^2	-9.640E-9	2.778E-9	-3.400	-3.470	.0010



# Results:

## Demographic Analysis: County Population

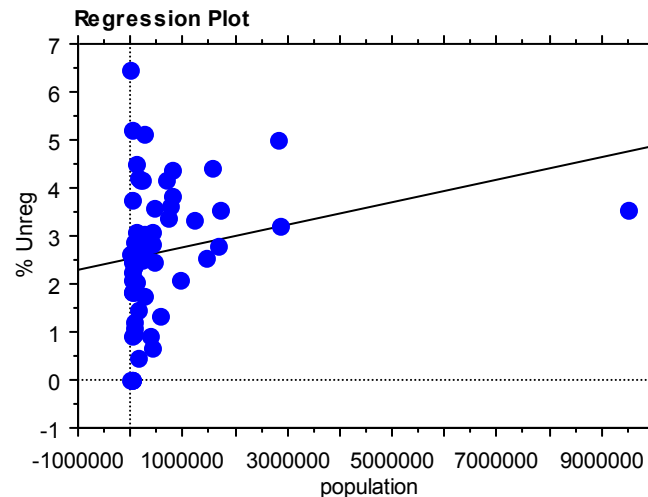
% Unreg vs. population

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	5.722	5.722	2.864	.0962
Residual	56	111.907	1.998		
Total	57	117.629			

Regression Coefficients

% Unreg vs. population

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	2.517	.202	2.517	12.431	<.0001
population	2.344E-7	1.385E-7	.221	1.692	.0962



$$Y = 2.517 + 2.344E-7 * X; R^2 = .049$$

# Results:

## Demographic Analysis: County Percent Home Ownership

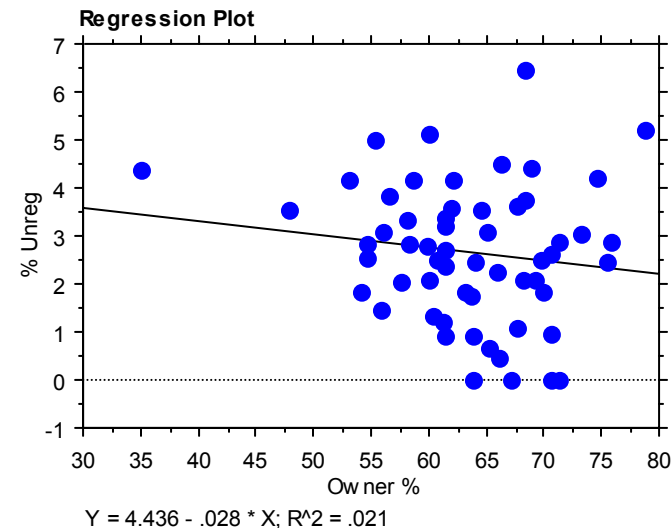
% Unreg vs. Owner %

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	2.482	2.482	1.207	.2766
Residual	56	115.147	2.056		
Total	57	117.629			

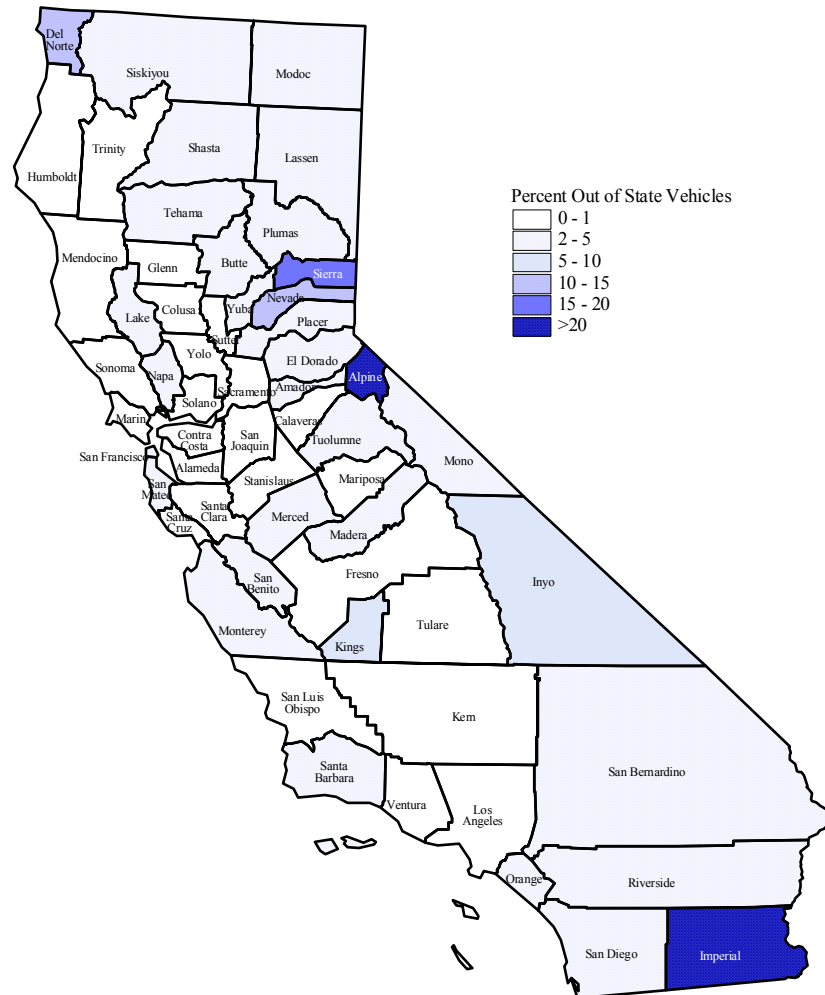
Regression Coefficients

% Unreg vs. Owner %

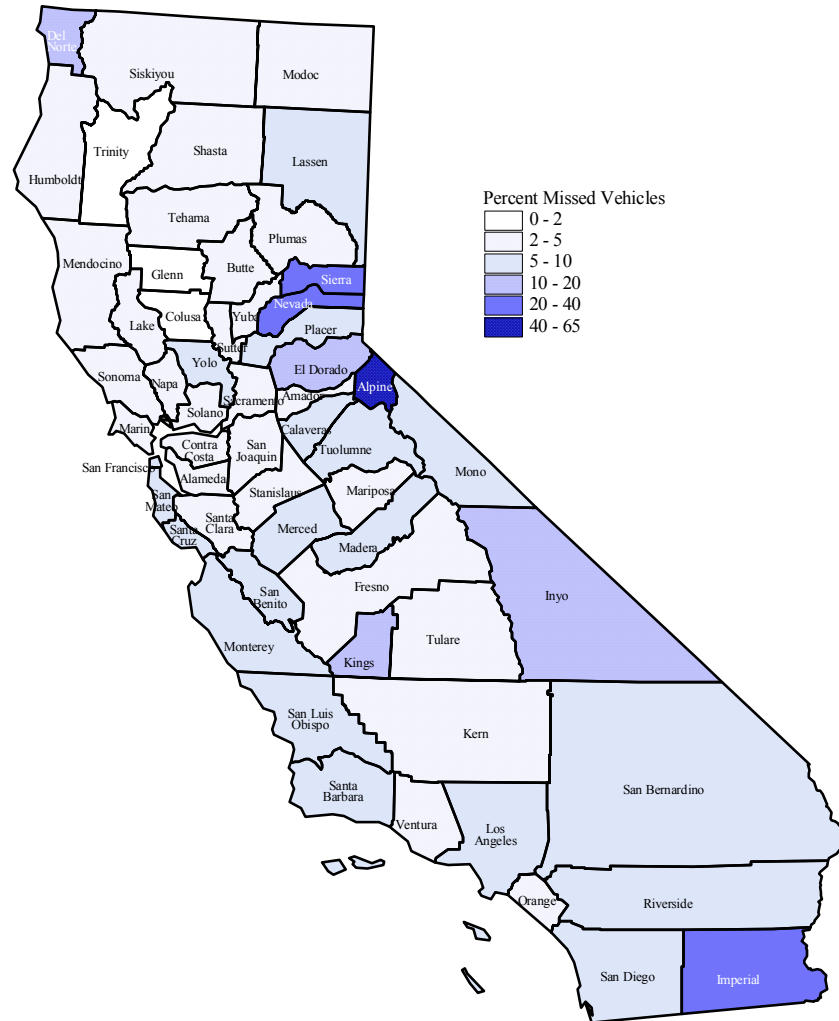
	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	4.436	1.633	4.436	2.716	.0088
Owner %	-.028	.026	-.145	-1.099	.2766



## Out of State Vehicles

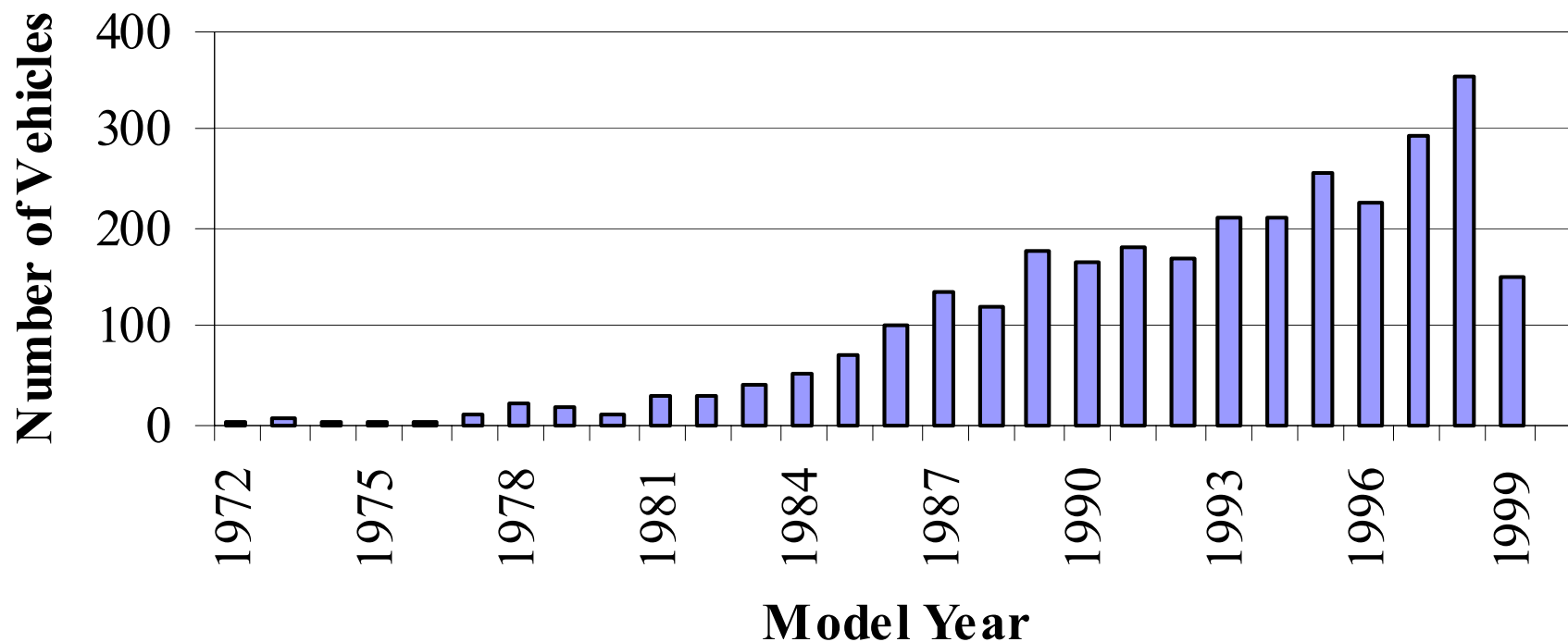


## Percentage of missed vehicles



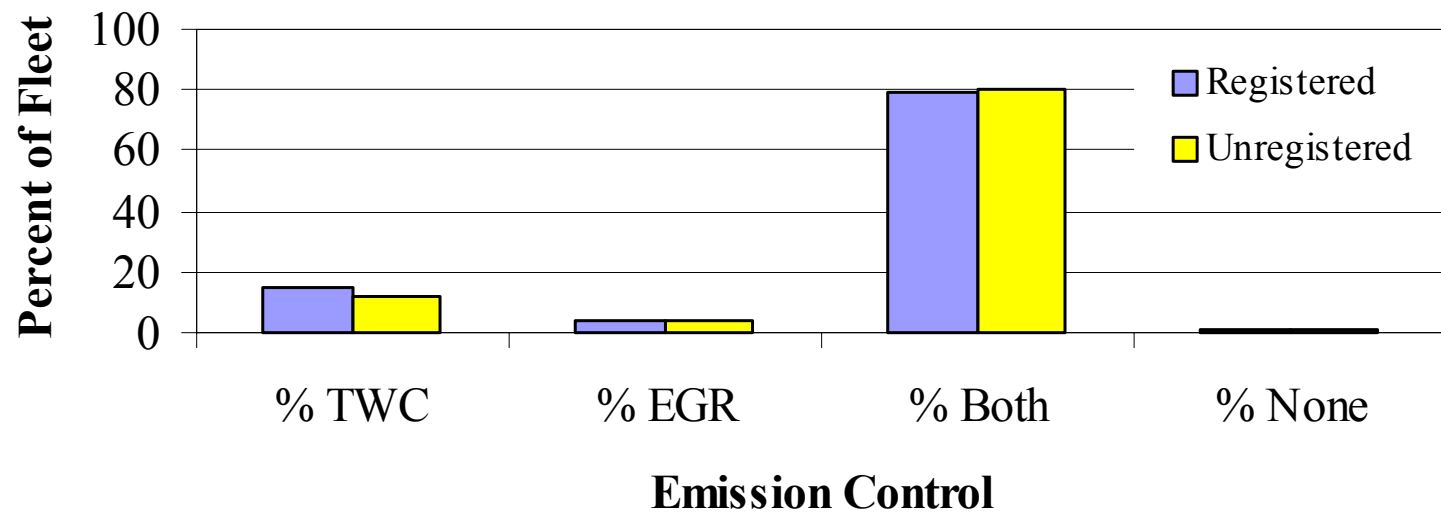
# Results:

## Riverside County: Fleet composition



# Results:

## Riverside County: Emission controls

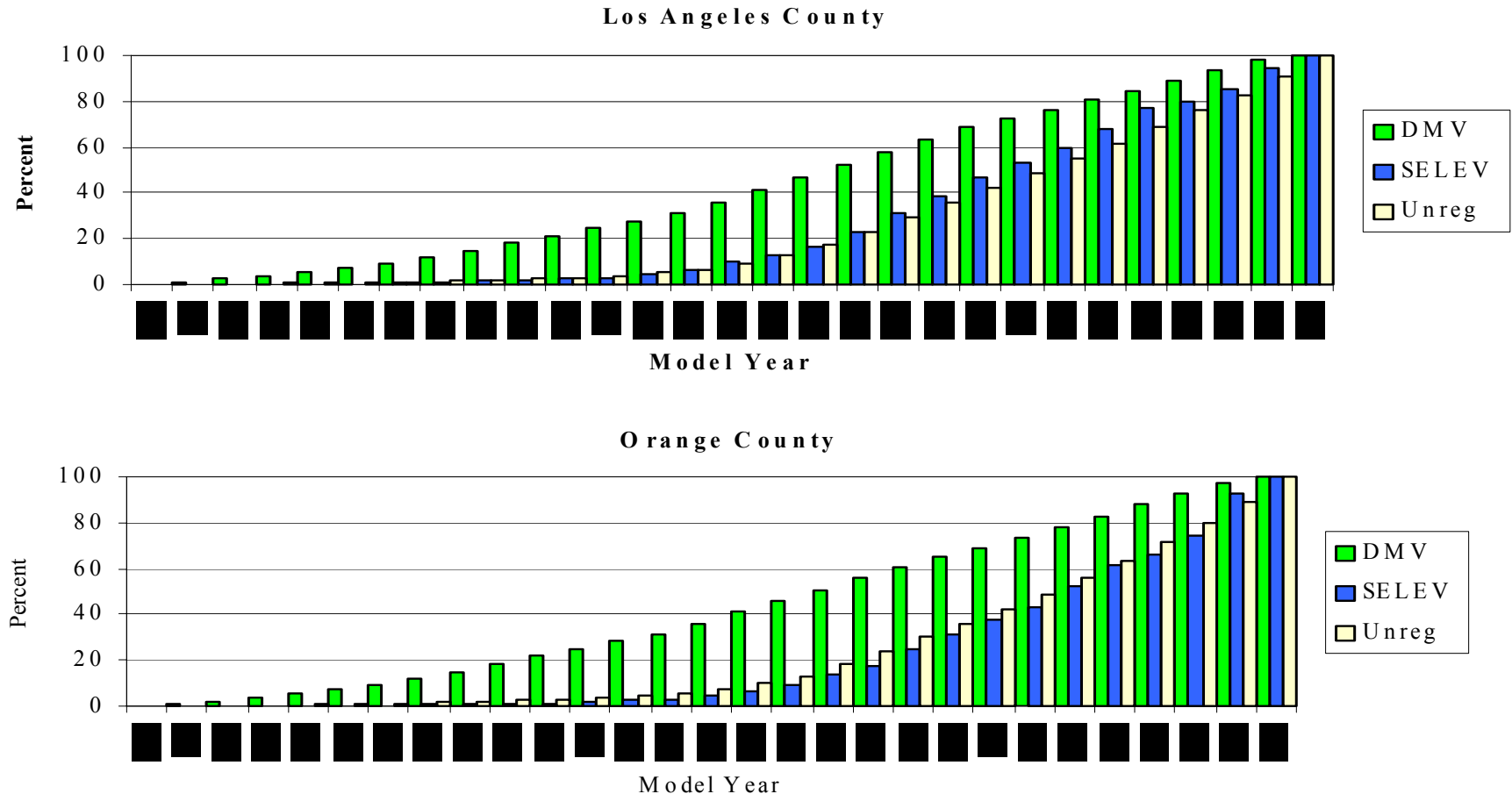


	TWC	EGR	Both	Neither	Unknown	Total
Registered	342	80	1803	18	22	2265
Unregistered	14	5	93	1	3	116



# Results:

## Fleet Composition: DMV, On-Road, and Parking Lot



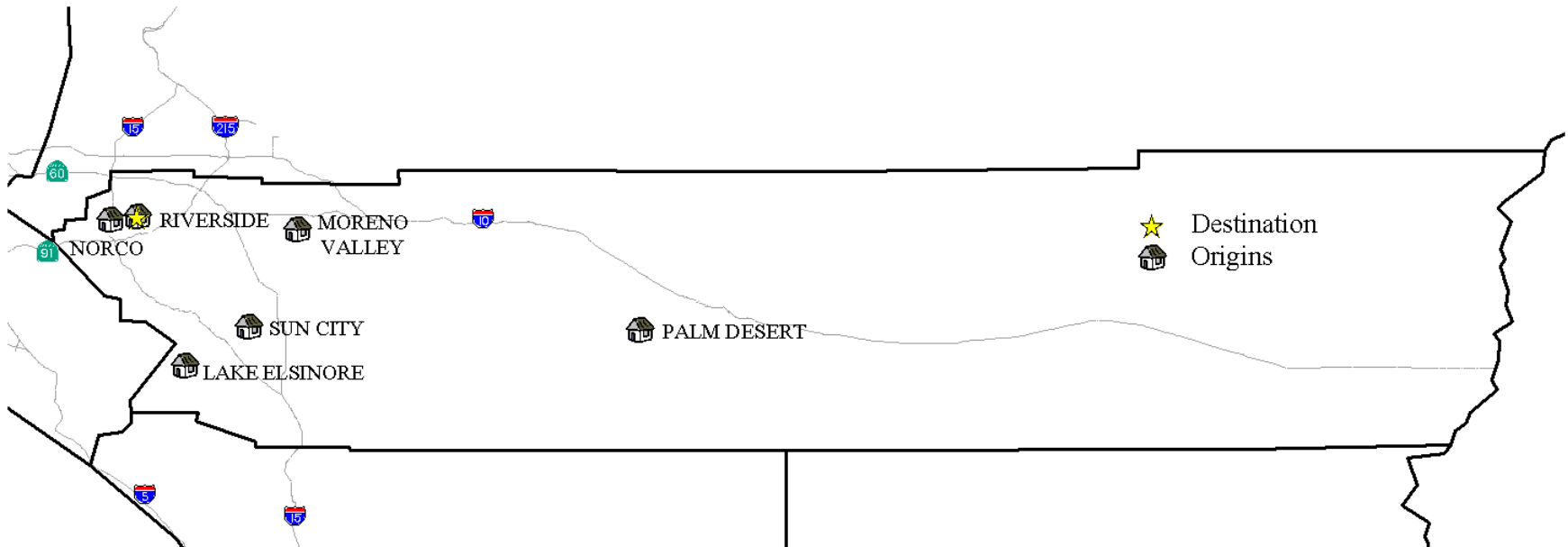
# Results:

## Smog Check Analysis; 64,892 license plates having Smog Check and observed registration status.

Field Status	Number	Pass		Failed		Gross Polluter		Tampered		Aborted		Unknown	
		#	%	#	%	#	%	#	%	#	%	#	%
Registered	51974	50423	97	682	1.3	250	0.48	25	0.1	391	0.8	203	0.4
Instantaneous	1449	1385	95.6	30	2.1	13	0.90	2	0.1	12	0.8	7	0.5
Long Term	601	549	91.4	18	3	19	3.16	2	0.3	10	1.7	3	0.50
Chronic	13	11	84.6	1	7.7	1	7.69	0	0.00	0	0.00	0	0.00
Front	4921	4716	95.8	91	1.9	44	0.89	4	0.1	44	0.9	22	0.5
Unknown	7387	7015	95	157	2.1	66	0.89	13	0.2	83	1.1	53	0.7
Total	66346	64100		979		393		46		540		288	

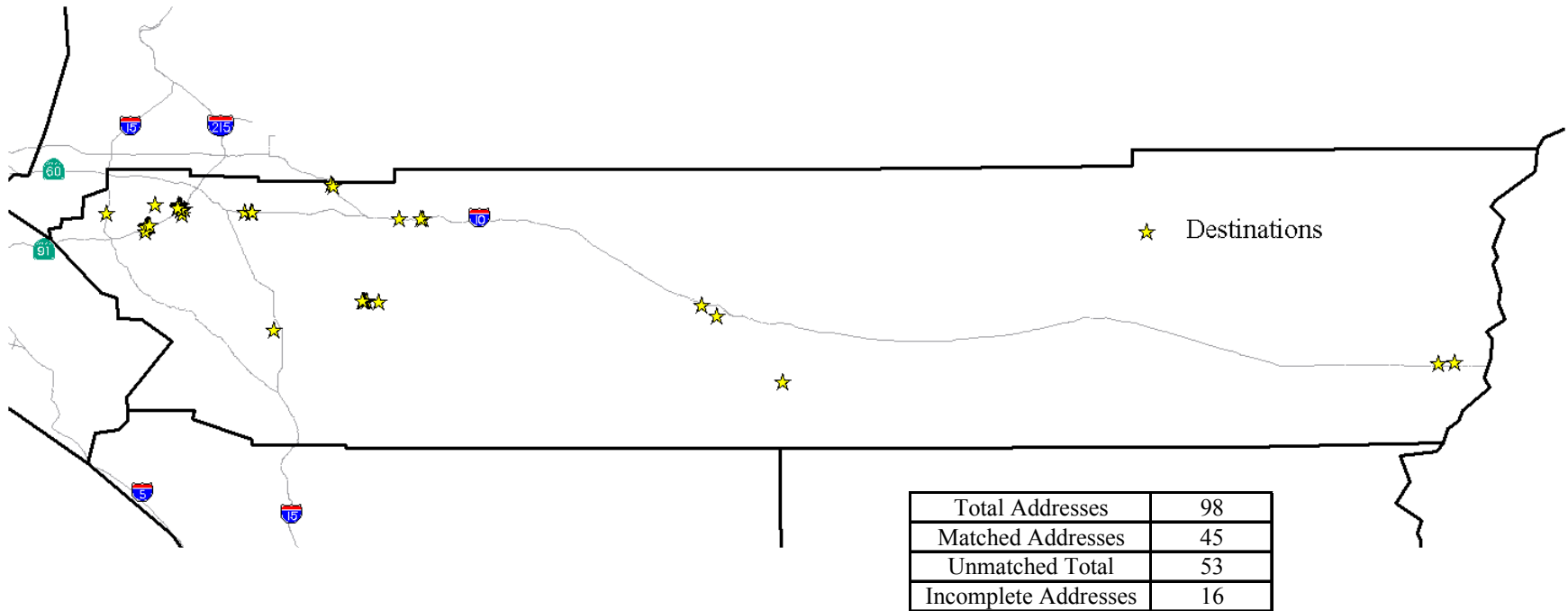
## ***Results:***

## Travel Study: Origins and destination locations by zip code for 92505



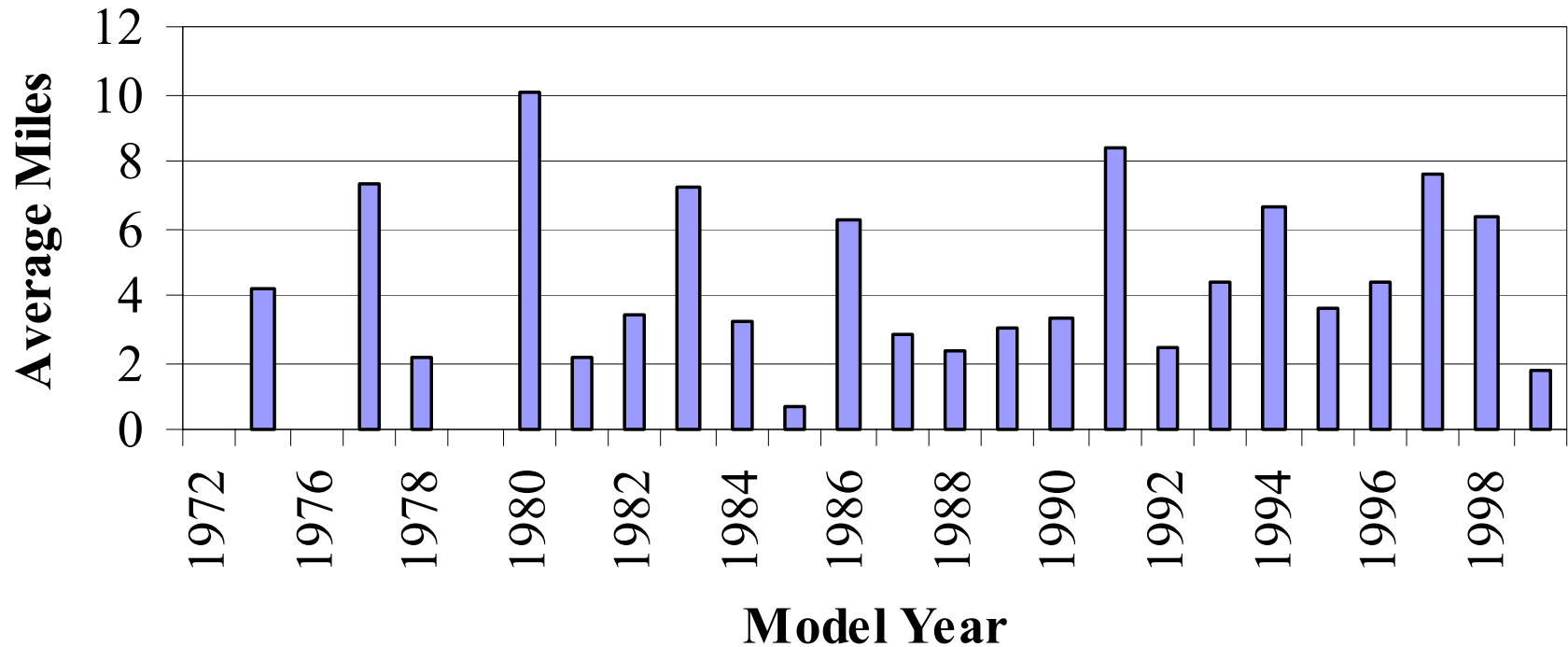
# Results:

## Travel Study Example: Geocoded destination locations for all of Riverside County



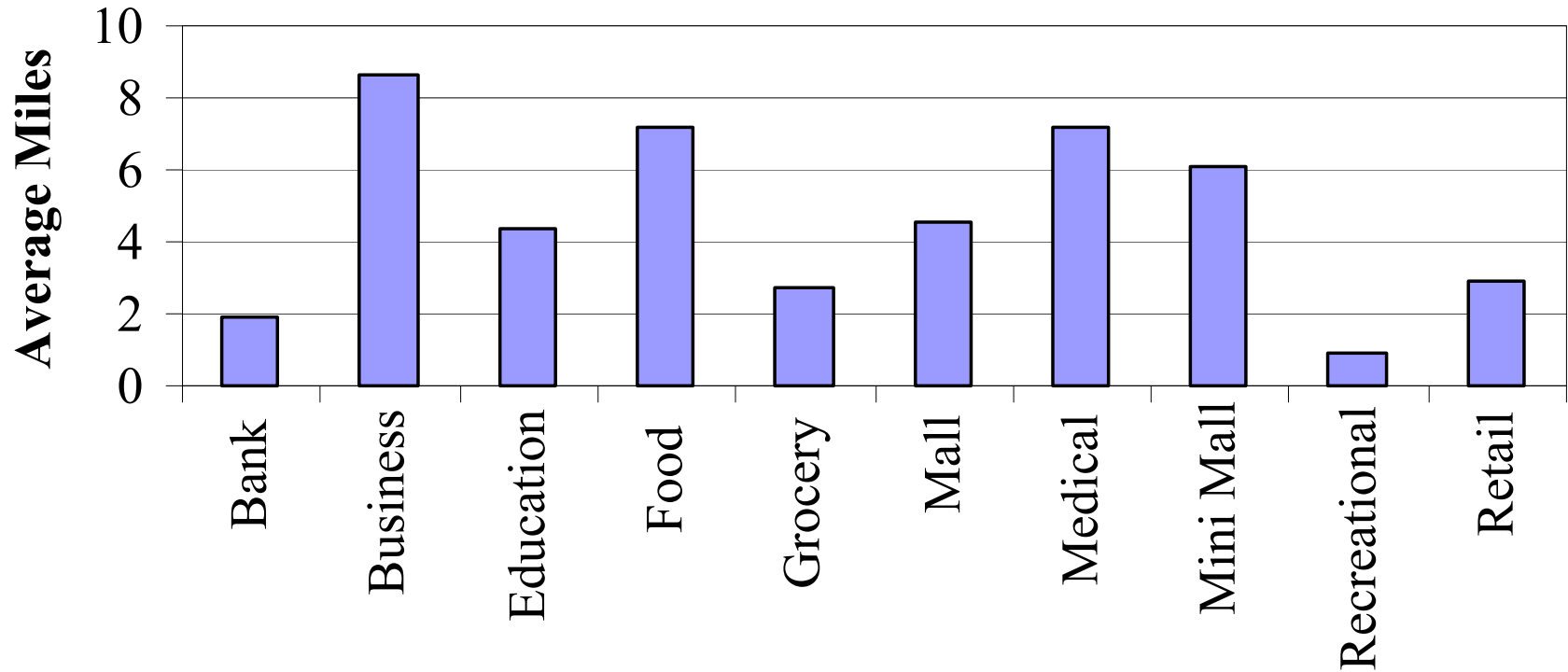
# Results:

## Travel Study: Average miles traveled in Riverside County by model year



# Results:

## Travel Study: Average miles traveled in Riverside County by business type



# ***Conclusions:***

- **Unregistered vehicles typically older than the general vehicle population.**
- **Higher proportions of out of state vehicles on the road in:**
  - **Counties near the state border.**
  - **Zip codes and counties with tourist attractions.**

## ***Future Work:***

- **Comparison of observed registration to DMV registration.**
- **Comparison of Smog Check results for registered and unregistered vehicles.**
- **In-depth travel study:**
  - **Geocode in ArcView all origins (home address of registered vehicle) and destinations (address of data collection sites).**
  - **Determine distance traveled by model year, business type and characterize cross county travel.**



## Samples of Captured Vehicles



## California - Summer 2000

